

CLAIMS

1. A development method in which, while stirring a developer which is a mixture of a magnetic carrier and a toner and supplying the toner of the developer, a toner density TD (%) of the developer is measured, and the toner is supplied to the developer, depending on a reduction in the measured toner density TD (%), wherein

the toner is supplied to the developer so that the measured toner density TD (%) falls within a range specified by:

$$TD \leq \{y_t \cdot V_t / N_t / (y_c \cdot V_c)\} \times 100 \quad (1)$$

$$V_t = (\pi/6) \cdot (D_{tav_pop})^3$$

$$S_c = \pi \cdot (D_{cav_pop} + D_{tav_pop})^2$$

$$N_t = S_c / [(3^{0.5}/2) \cdot (D_{tav_pop})^2] / 2$$

$$V_c = (\pi/6) \cdot (D_{cav_pop})^3$$

where a number average diameter of the magnetic carrier is represented by D_{cav_pop} (μm), a number average diameter of the toner is represented by D_{tav_pop} (μm), a specific gravity of the magnetic carrier is represented by y_c , and a specific gravity of the toner is represented by y_t .

2. A development method in which, while stirring a developer which is a mixture of a magnetic carrier and a toner and supplying the toner of the developer, a toner density TD (%) of the developer is measured, and the toner is supplied to the developer, depending on a reduction in the measured toner density TD (%), wherein

the toner is supplied to the developer so that the measured toner density TD (%) falls within a range specified by:

$$TD \leq \{y_t \cdot V_t / N_t / (y_c \cdot V_c)\} \times 100 \quad (2)$$

$$V_t = (\pi/6) \cdot (D_{tav_vol})^3$$

$$S_c = \pi \cdot (D_{cav_vol} + D_{tav_vol})^2$$

$$N_t = S_c / [(3^{0.5}/2) \cdot (D_{tav_vol})^2] / 2$$

$$V_c = (\pi/6) \cdot (D_{cav_vol})^3$$

where a volume average diameter of the magnetic carrier is represented by D_{cav_vol} (μm), a volume average diameter of the toner is represented by D_{tav_vol} (μm), a specific gravity of the magnetic carrier is represented by γ_c , and a specific gravity of the toner is represented by γ_t .

3. A development method in which, while stirring a developer which is a mixture of a magnetic carrier and a toner and supplying the toner of the developer, a toner density TD (%) of the developer is measured, and the toner is supplied to the developer, depending on a reduction in the measured toner density TD (%), wherein

the toner is supplied to the developer so that the measured toner density TD (%) falls within a range specified by:

$$TD \leq [5.1(D_{cav_vol})^{1.17}] \times 100 \quad (3)$$

where a volume average diameter of the magnetic carrier is represented by D_{cav_vol} (μm), and a volume average diameter of the toner is 5.5 (μm).

4. A development method in which, while stirring a developer which is a mixture of a magnetic carrier and a toner and supplying the toner of the developer, a toner density TD (%) of the developer is measured, and the toner is supplied to the developer, depending on a reduction in the measured toner density TD (%), wherein

the toner is supplied to the developer so that the measured toner density TD (%) falls within a range specified by:

$$TD/(D_{tav_vol})^{1.2} \leq [5.1(D_{cav_vol})^{1.17}/5.5^{1.2}] \times 100 \quad (4)$$

where a volume average diameter of the magnetic carrier is represented by D_{cav_vol} (μm), and a volume average diameter of the toner is represented by D_{tav_vol} (μm).

5. The development method according to any of claims 1 to 4, wherein the toner is a toner produced by a pulverizing method.
6. The development method according to any of claims 1 to 4, wherein the toner has a diameter distribution with a standard deviation σ of 15 (%) or more.
7. The development method according to any of claims 1 to 4, wherein the toner has a pigment concentration of 5 (%) or more.
8. A development apparatus in which a developer which is a mixture of a magnetic carrier and a toner is stirred and the toner of the developer is supplied, comprising detecting means for measuring a toner density TD (%) of the developer and supplying means for supplying the toner to the developer, depending on a reduction in the measured toner density TD (%), wherein the supplying means supplies the toner to the developer so that the measured toner density TD (%) falls within a range specified by:
- $$TD \leq \{\gamma_t \cdot V_t / N_t / (\gamma_c \cdot V_c)\} \times 100 \quad (1)$$
- $$V_t = (\pi/6) \cdot (D_{tav_pop})^3$$
- $$S_c = \pi \cdot (D_{cav_pop} + D_{tav_pop})^2$$
- $$N_t = S_c / [(3^{0.5}/2) \cdot (D_{tav_pop})^2] / 2$$
- $$V_c = (\pi/6) \cdot (D_{cav_pop})^3$$
- where a number average diameter of the magnetic carrier is represented by D_{cav_pop} (μm), a number average diameter of the toner is represented by D_{tav_pop} (μm), a specific gravity of the magnetic carrier is represented by γ_c , and a specific gravity of the toner is represented by γ_t .
9. A development apparatus in which a developer which is a mixture of a magnetic carrier and a toner is stirred and the toner of the developer is supplied, comprising detecting means for measuring a toner density TD (%) of

the developer and supplying means for supplying the toner to the developer, depending on a reduction in the measured toner density TD (%), wherein

the supplying means supplies the toner to the developer so that the measured toner density TD (%) falls within a range specified by:

$$5 \quad TD \leq \{\gamma_t \cdot V_t / N_t / (\gamma_c \cdot V_c)\} \times 100 \quad (2)$$

$$V_t = (\pi/6) \cdot (D_{tav_vol})^3$$

$$S_c = \pi \cdot (D_{cav_vol} + D_{tav_vol})^2$$

$$N_t = S_c / [(3^{0.5}/2) \cdot (D_{tav_vol})^2] / 2$$

$$V_c = (\pi/6) \cdot (D_{cav_vol})^3$$

10 where a volume average diameter of the magnetic carrier is represented by D_{cav_vol} (μm), a volume average diameter of the toner is represented by D_{tav_vol} (μm), a specific gravity of the magnetic carrier is represented by γ_c , and a specific gravity of the toner is represented by γ_t .